I CLAIM:

1. In the method of consolidating a body in any of initially powdered, sintered, fibrous, sponge, or other form capable of compaction, that includes the steps:

a) providing flowable pressure transmission particles having carbonaceous and ceramic composition or compositions,

b) heating said particles to elevated temperature,

c) locating said heated particles in a bed,

d) positioning said body at said bed, to receive pressure transmission,

e) effecting pressurization of said bed to cause pressure transmission via said particles to said body, thereby to compact and consolidate the body into desired shape, increasing its density;

f) the body consisting essentially of one or more metals selected from the following group: tungsten, rhenium, uranium, tantalum, platinum, copper, gold, hafnium, molybdenum, titanium, zirconium and aluminum;

g) said consolidated body having, along a body dimension, one of the following characteristics:

i) decreasing strength

ii) increasing ductility

iii) decreasing strength, and increasing ductility.

2. The method of claim 1 wherein the body has varying metallic composition along said dimension.

3. The method of claim 1 wherein said varying metallic composition is characterized by a series of zones, the metal of each zone having a characteristic composition which differs from that of an adjacent zone or zones.

4. The method of claim 3 wherein the metals in at least two successive zones consist substantially of tantalum, and tantalum consolidated with a metal or metals selected from the group tungsten, rhenium, uranium, tantalum, platinum, copper, gold, hafnium, molybdenum, titanium, zirconium and aluminum.

5. The method of claim 1 wherein said body consists of powders of metals that have been initially combined and compressed into body form, at pressure exceeding 20,000 pounds per square inch, prior to said step e) pressurization.

6. The method of claim 5 wherein at least part of said body has one of the following forms:

i) cone

ii) lens

iii) cylinder

iv) cylinder and cone combination

v) cylinder and lens combination.

7. The method of claim 5 including pre-heating said body to temperature in excess of 900°C, subsequent to said initial combining and compressing and prior to said pressurization.

8. The method of claim 5 including effecting said initial combining and compressing at ambient temperature.

9. The method of claim 5 including providing an elastomeric container, positioning said powders in said container, and effecting said initial compressing by compressing said container.

10. The method of claim 9 including evacuating gases from said container, prior to said initial compressing thereof.

11. The method of claim 10 including sealing of said container after evacuating gases therefrom.

12. The method of claim 11 wherein said initial compressing is effected to compress the body to about 60% of body theoretical density.

13. The method of claim 1 wherein said pressurization is effected to form the body into generally conical shape.

14. The method of claim 1 including effecting said initial compressing to form the body into generally cylindrical shape, with taper at one end.

15. The method of claim 14 wherein said pressurization is carried out to reduce the body size while maintaining body generally cylindrical shape with taper at one end.

16. The method of claim 5 wherein the powders at one zone of the body consist essentially of tantalum particles coated with substance or substances selected from the group that include tungsten, rhenium, uranium, platinum, copper, gold, hafnium, molybdenum, titanium, zirconium and aluminum.

17. The method of claim 16 wherein the weight percent of said substance or substances is about 16% of the overall weight of the total powder.

18. The consolidated body produced by the method of claim 1.

19. The method of claim 1 wherein said particles are generally spheroidal and consist of graphite, and/or graphite and ceramic composite.

20. The method of claim 1 wherein said body in said bed, prior to said step e) is at a temperature between about 200°C. and 1,800°C.

21. The method of claim 1 wherein said body is positioned in said bed to be surrounded by said particulate, the bed consisting substantially entirely of particles in the form of graphite and/or graphite/ceramic beads.

22. The method of claim 15 wherein said bed contains sufficient of said flowable particles as to remain essentially free of agglomeration during said (e) step.

23. The method of claim 1 wherein said bed consists essentially of one of the following particulates:

i) graphite

ii) ceramic

iii) graphite and ceramic.

24. The method of claim 23 wherein the particle mesh size is between 50 and 240.

25. The method of consolidating metal powder to form an object, that includes:

a) pressing said powder into a preform, and preheating the preform to elevated temperature,

b) providing flowable pressure transmitting particles and heating said particles, and providing a bed of said flowable and heated pressure transmitting particles,

c) positioning the preform in such relation to the bed that the particles substantially encompass the preform,

d) and pressurizing said bed to compress said particles and cause pressure transmission via the

particles to the preform, thereby to consolidate the preform into a desired object shape,

e) the preform consisting of one or more metals selected from the following group: tungsten, rhenium, uranium, tantalum, platinum, copper, gold, hafnium, molybdenum, titanium, zirconium and aluminum.

26. The method of claim 25 wherein the powder at one zone of the body consists of tantalum particles coated with substances selected from the group that includes tungsten, rhenium, uranium, platinum, copper, gold, hafnium, molybdenum, titanium, zirconium and aluminum.

27. The method of claim 26 wherein the weight percent of said substances is about 16% of the overall weight of the total powder.

28. The method of claim 25 wherein said pressurization is effected at levels greater than about 20,000 psi for a time interval of less than about 30 seconds.

29. The method that includes

a) providing particles to be used in pressure consolidation of a powdered preform;

b) heating said particles,

c) and pressurizing the heated particles to effect said consolidation,

d) said preform consisting essentially of metallic particles selected from the following group: tungsten, rhenium, uranium, tantalum, platinum, copper, gold, hafnium, molybdenum, titanium, zirconium and aluminum.

30. The method of claim 29 wherein the particles include tantalum which constitutes more than 50% of the overall weight of the preform.

31. The method of claim 29 wherein the preform initial powder consists of tantalum particles on which the metallic particles are coated.

32. A metallic body which has been compressed and consolidated from an initial powder metal form to a highly densified form, the body consisting of at least two metals, the proportions of which vary along a body dimension, one of said metals being tantalum.

33. The body of claim 32 wherein the body consists of at least four metals.

34. The body of claim 33 wherein said metals are selected from the group that includes tungsten, rhenium, uranium, tantalum, platinum, copper, gold, hafnium, molybdenum, titanium, zirconium and aluminum.

35. The body of claim 32 wherein the body is elongated and has a tapered nose portion, there being a second body portion along said dimension, the body consisting of at least two metals, M_1 and M_2, the proportions of M_1 and M_2 in said body nose portion and second body portion being different.

36. The body of claim 35 wherein the metal M_1 is tantalum, the proportion of tantalum in said nose portion being greater than the proportion of tantalum in said second body portion.

37. The body of claim 36 wherein the body has third and fourth body portions along said dimension, the proportion of tantalum in said second body portion exceeding the proportion of tantalum in said third body portion, and the proportion of tantalum in said third body portion exceeding the proportion of tantalum in said fourth body portion.

38. The body of claim 32 wherein the body has first and second ends, the consolidated metal at the first end having higher density than the metal at the second end.

39. The body of claim 38 wherein the metal at the first end consists primarily of tantalum, and the metal at the second end consists primarily of M_1, M_2, or M_x.

40. A pressure consolidated powdered metal product wherein the powdered metal is distributed in successive layers, each layer having a different weight percentage of consolidated powdered metals, at least one of the powdered metals being tantalum.

41. The body of claim 32 which has decreasing strength or ductility in each of two body dimensions.

42. The body of claim 41 wherein said two dimensions are length and thickness.

43. The body of claim 41 wherein said two dimensions are longitudinal and lateral.

44. The body of claim 41 wherein said body tapers toward a top zone, the body ductility and/or strength being greatest at said top zone.

45. The body of claim 41 wherein said body comprises a conical shell.

46. The body of claim 41 which has a cylindrical section and a tapered section at one end of the cylindrical section.

47. The method of claim 32 wherein the consolidated tantalum has <111> texture of less than about 2.8X random.